Kalman Filters

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The motion of a satellite, the trajectory of an airplane, the position of a boat: all these quantities can be predicted accurately and efficiently with a Kalman filter. Since its introduction half a century ago, the Kalman filter has revolutionized the field of applied optimal estimation. Literally hundreds of applications have been made and the number is still growing. Also atomic timing benefits greatly from the Kalman filter. GPS time, for instance, is generated by the Composite Clock, an algorithm based on the Kalman filter. In this tutorial we do two things. First, we define the Kalman filter by using a simple example, namely, the motion of a boat. Second, we discuss a few applications of the Kalman filter to atomic timing, including the GPS Composite Clock.